



## Original communication

## Applying forensic anthropological data in homicide investigation to the depravity standard

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## ABSTRACT

Forensic anthropology can provide detailed information regarding the perpetrator's treatment of a homicide victim. This data may inform The Depravity Standard (DS), a forensic science inventory used to assess the severity of a homicide's intent, actions, victimology, and attitudes. Skeletal data enabled the reconstruction of a homicide case involving mutilation and possible torture. Using The Depravity Standard (DS) the skeletal data underwent evaluation in order to provide evidence of depravity. The osteological data alone offered sufficient evidence for a number of criteria of depravity, demonstrating the importance and application of osteology in resolving specific questions about the depravity of a homicide.

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## 1. Introduction

Determining which homicides warrant greater penalty by virtue of their brutality is an unaddressed shortcoming of existing criminal sentencing schemes. At times, sentencing is influenced by convincing juries that the perpetrator's committed acts were essentially heinous, atrocious, or cruel. In some capital cases, a crime determined to exhibit "depravity" may result in the death penalty.<sup>1</sup>

These terms, however, are ambiguous — especially when applied to naturally extreme crimes such as homicide. Therefore, there is a justified need to distinguish what acts and qualities of homicides distinguish themselves as depraved. Once this terminology is standardized, courts can utilize an evidence-based measure to appraise depravity with greater fairness.

Reconstruction of death and the circumstances surrounding it are possible in forensic anthropological analyses of skeletons.<sup>2,3</sup> The objective forensic anthropological reconstruction of death, combined with objective forensic science analyses of those circumstances using The Depravity Standard (DS), can provide

scientific evidence for a measure of criminal depravity.<sup>4,5</sup> A case presentation from Nebraska illustrates this, as anthropological and psychological analysis provided evidence that assisted in distinguishing depravity.

Previous research has described the development of the DS.<sup>4,5</sup> The intent of the authors of the DS is to reduce the arbitrary nature currently accompanying the determination of such powerful terms (i.e. "heinous") and to refine an evidence-based, qualitative and quantitative measure of criminal depravity. The implications of this standardization include consistent application of justice, distinction of crimes that warrant greater culpability, establishment of barriers to the overcharging of criminal cases for political or other reasons, and the creation of a narrowed class of capital-eligible defendants. Ultimately, the DS contributes to sentencing fairness in violent and non-violent criminal cases.

There are 25 aspects of heinous crimes currently under consideration in The Depravity Standard (Table 1). Some of these elements of depravity are discernable only from interviews of the defendant or witnesses. Some qualities of a crime; however, can be evaluated by direct examination of the victim's physical remains.<sup>6–8</sup> Through this case presentation, the authors intend to demonstrate that evidence from forensic examination of the remains can speak to the presence or absence of particular items of the DS.

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**Table 1**  
Intents, actions, and attitudes under study in the Welner depravity standard (WDS).

Item	Description
1.	Intent to emotionally traumatize the victim, or to maximize terror through humiliation – Evidence demonstrates expressed or implied intent to cause major emotional impact/emotional torture on the victim, regardless of whether the victim actually experienced it.
2.	Intent to maximize damage or destruction, by numbers or amount if more than one person is victimized, or by suffering and degree if only one person is victimized – Evidence demonstrates the perpetrator's goal of damaging the victim physically or materially as much as possible. The large scale and severity of damage is an essential element of the plan.
3.	Intent to cause physical disfigurement – Evidence demonstrates the objective to produce permanent disfigurement, and to create a mutilated victim.
4.	Intent to carry out a crime for excitement of the criminal act alone – The perpetrator's excitement, thrill, and intrigue is a component of the motive. The thrill and satisfaction of the criminal enterprise includes the excitement of carrying out the crime to see whether one can get away with it.
5.	Targeting victims who are not merely vulnerable, but helpless – The perpetrator targets a victim relatively helpless because of clearly lacking sophistication or physical limitations. These include the mentally retarded, infants, the demented, the physically handicapped, the unconscious, immobilized, or the seriously mentally ill.
6.	Carrying out a crime in spite of a close and trusting relationship to the victim – The specific targeting and exploiting of a trusted relationship for criminal activity, when that relationship would customarily inspire trust and safety.
7.	Influencing depravity in others in order to destroy more – Specifically recruiting another or others to effect a grander plan. This may connote a leader who may participate directly in the criminal act or solely direct the component participants to an outcome far greater than what he could carry out alone.
8.	Escalating the depravity; inspiration for more – A longer-term plan to similarly offend again, incorporating increasingly severe actions. Specifically, a history of offense and the intent of escalation, amplification or expansion from previous but similar exploits.
9.	Carrying out a crime in order to terrorize others – The objective to inspire a sense of fear, hesitation, and alarm in others who are aware of but not necessarily directly affected by the crime itself.
10.	Carrying out a crime in order to gain social acceptance or attention – The perpetrator uses crime to make a demonstration to impress upon friends, or those he or she does not know, or an entire community.
11.	Influencing criminality in others to avoid prosecution or penalty – Enlistment of someone otherwise disinterested to carry out a crime specifically for the purpose of keeping one from being held accountable.
12.	Disregarding the known consequences to the victim – The perpetrator clearly has an opportunity to ponder the greater impact upon the victim including to loved ones or dependents, yet nevertheless evidences a choice to continue the crime. For example, the victim clearly shares the consequences of a crime to the perpetrator, who nevertheless proceeds.
13.	Targeting victims based upon prejudice – The perpetrator's deliberate and malicious targeting of a victim or victims based upon particular group characteristics. These may include gender, race, national origin, religion, sexual orientation, physical handicap or deformity.
14.	Prolonging the duration of the victim's suffering. – Extension or heightening of the victim's physical suffering. The perpetrator clearly prolongs agony.
15.	Unrelenting physical and emotional attack; amount of attacking – The amount of attacking unleashed, the savagery, not necessarily the injuries suffered by the victim, but rather the quantity of blows inflicted.
16.	Exceptional degree of physical harm; amount of damage – The severity of the damage inflicted, as well as the multiplicity of severely damaged areas.
17.	Unusual quality of suffering of the victim; victim demonstrated panic, terror, and helplessness – The level of emotional suffering endured by the victim during the crime, such as the consideration of helplessness and impending death, or threat to body integrity.
18.	Indulgence of actions, inconsistent with the social context – A crime may already have been carried out, yet perpetrators continue to act gratuitously against the victim.
19.	Carrying out attack in unnecessarily close proximity to the victim – Physical proximity and intimate interaction are not essential to the completion of the criminal enterprise, but the perpetrator forces an intimacy over and above the violation.
20.	Extreme response to trivial irritant; actions clearly disproportionate to the perceived provocation – A response clearly out of proportion to its immediate provocation (i.e. gross overreaction.), as the perpetrator perceives it.
21.	Satisfaction or pleasure in response to the actions and their impact – The perpetrator's satisfaction or pleasure after the crime has already been committed, and the perpetrator's attitude is one of relish or celebration.
22.	Despite criminal responsibility, falsely implicating or accusing others of actions, knowingly exposing them to penalty, resulting in the falsely accused being investigated and jailed, and perhaps even tried – By framing or direct suggestion, the perpetrator fingers a specific individual and has reason to believe that specific individual would be held accountable.
23.	Projecting responsibility onto the victim; feeling entitlement to carry out the action – The perpetrator, after the fact, blames the victim against all evidence of provocation, and the perpetrator's attitude of projecting responsibility.
24.	Disrespect for the victim after the fact – A contemptuous attitude about the victim and crime, reflecting the persistent disrespect and debasement of the victim or the victimized institution after the fact.
25.	Indifference to the actions and their impact – Lack of remorse, most exceptional with increasing enormity of the offense.

## 2. Background

On April 26, 1992, a dog discovered one skull fragment along the roadway which led to the discovery of the scattered skeleton and associated clothing. Following Nebraska State unmarked burial law,<sup>9</sup> archaeologists with the Nebraska State Historical Society did an on-site investigation to determine whether the area represented a crime scene or was simply a historic burial site. Once the criminal nature of the scene was determined, the Nebraska State Patrol, advised by archaeologists, accomplished the recovery of the remains, beginning with the mapping and collection of isolated surface bones. Prairie grass enveloped some of the remains, causing a natural preservation of the remains in sod – the surface layer of ground consisting of a mat of grass and grass roots. Removal of articulated bones and bones associated with the remains of clothing occurred in sections of sod.

The county attorney and forensic pathologist decided to include archaeologists and anthropologists from the University of

Nebraska – Lincoln and the Nebraska State Historical Society in the investigation. The analysis was done in the University of Nebraska State Museum. Museum archaeologists and anthropologists transferred the blocks of sod to a secure lab area for excavation. Laboratory excavation of sod blocks recovered from the crime scene was necessary to recover some of the bones and clothing. The bones were cleaned using brushes and plastic excavation tools with precautions taken not to mar the surfaces of the bones.

## 3. Recovery and analysis of skeletal remains

Found in one small block of sod were the articulated eighth and ninth thoracic vertebrae in anatomical association with ribs. This indicates that the body was in a state of partial articulation when deposited and that sections of the body were disposed of at the crime scene.

Examiners unearthed a second block of soil containing the victim's brassiere. Wrapped in the brassiere straps were the five

right ribs, the sixth to the tenth (Fig. 1). During the excavation, as soil and rootlets were brushed away investigators noted that the ribs had cut marks on them. One of these six ribs exhibited a clean cut. The 7th and 8th ribs exhibited hesitation marks, indicating unsuccessful attempts to cut those bones.

This type of variation in cut marks as evidenced in the ribs excavated from the sod, are highly indicative of post-mortem exploration, experimentation, disarticulation, undressing, and redressing of the victim.<sup>10</sup> The victim's undergarments (which the victim normally wore) were notably missing.

Excavation also uncovered a large block of sod containing the left sweater sleeve. Before excavation, the block was X-rayed. The three arm bones appeared in anatomical order within the soil-encapsulated sleeve. Importantly, the sleeve contained a large amount of soil such that it retained its tubular shape. This suggests that as the soft tissue of the arm decomposed, soil and roots that infiltrated and penetrated through the sleeve replaced its bulk. However, as opposed to depositing the sleeve on the surface, where water activity would have flushed soil away leaving it collapsed, evidence indicated burial of the sleeve prior to excavation.

The presence of the arm bones in anatomical order within the sleeve indicates that this part of the body remained clothed when abandoned. This also presented evidence that the arm was not completely unclothed and disarticulated, although the thorax was unclothed and disarticulated. The growth of prairie grass roots through the sleeve suggested that the remains were at the crime scene for at least two growing seasons over a minimum of a three-year period.<sup>11</sup>

Examiners removed the left pants leg from a large block of sod, noting the pant leg to be in a state dissimilar to some other items of clothing located. Consistent with a garment previously removed and laid on the ground surface, the pants leg was flattened and did not contain any soil.

The remainder of the jeans rested in a block of sod separate from the left pants leg. Inconsistent with the findings of the left pants leg, the right femur was found in the right pants leg. Sharp implement marks were identified on the distal surface of the femur, but no cut marks were discernable on the pants, although poor preservation of the pants was noted. The presence of the right femur in the right pants leg further suggests that the victim was not fully clothed or may have been redressed before final deposition.

The forensic pathologist and anthropologists took the isolated findings and excavated remains to the morgue for analysis.



Fig. 1. Right ribs, sixth to tenth, were found wrapped in the brassiere straps.

Examiners arranged skeletal remains in anatomical order and noted anomalies and fractures. The investigation used photography to document the remains and macrophotography to record intentional alterations of the bones, utilizing a phototube on a binocular microscope.

After cleaning the bones and placing them in anatomical position, examiners studied the skeleton (Table 2). The axial and cranial skeletons were well preserved. The coccyx vertebrae were missing, as were two thoracic vertebrae from the axial skeleton. The cranial vault was fragmented. The recovery effort uncovered parts of the frontal, parietals, temporals, and the occipital superior to the foramen magnum. The facial skeleton was fragmented, but the left malar, left nasal, and inferior portions of both maxillae were recovered. The sphenoid was highly fragmented, as was the skeleton of the midfacial region, especially in the area of the superior maxillae. The mandible was intact. While no alteration due to animal disturbance was evident on any of these bones, all cranial vault fragments displayed bleaching from exposure to the environment.

Bones of the pectoral girdle and upper extremities included both clavicles, both scapulae, both humeri, along with the right radius, right ulna, and almost all of the bones of the left hand. No alteration due to animal disturbance was evident on any of these bones. The left humerus exhibited bleaching from exposure to the environment, similar to the skull fragments.

Excavation successfully recovered the sacrum; however, the rest of the pelvic girdle was not located. Both fibulae, both calcanea, the right femur, left tibia, right talus, and several other tarsals were recovered. The sacrum, fibulae, and tarsals had bleached from environmental exposure and the tarsals and fibulae exhibited damage consistent with animal disturbance, i.e. carnivore gnawing. The lack of the os coxae or innominate bones at the scene was puzzling due to the lack of evidence of carnivore activity at the crime scene. A potential explanation in this case would be, however, that the perpetrator took body parts as trophies.

#### 4. Estimation of race, sex and age

Cranial fragmentation hindered the determination of the decedent's race. Despite these challenges, caucasoid racial identity was indicated by non-metric characteristics of the skull and by the morphology of the distal femur as the skull, even when fragmented, can provide non-metric indications of racial affinity.<sup>12</sup> In this case, the fragmentation of the cranial vault and facial skeleton made metric analysis impossible; however, examiners analyzed non-metric traits. Importantly, few non-metric traits alone are definitive indicators of racial affinity. Most of the scorable traits were consistent with caucasoid affinity. However, the deceased did exhibit shoveled incisors, which is more typical of mongoloids.

Further evaluation of caucasoid or negroid affinity was carried out by examination of the femur. Scott et al.<sup>13</sup> demonstrated that the maximal intercondylar notch height, which is an indirect measure of femoral bowing, is useful in estimating racial affinity. The maximum notch height for this individual is 27 mm. The 27 mm value measured for the unknown skeleton falls out of the range of one standard deviation for negroids and in the range of one standard deviation for caucasoids.

The absence of the os coxae made it necessary to rely on other secondary indicators of sex found both in both the cranial and post-cranial skeleton. With two exceptions, all recordable cranial traits were consistent with females. Steel and Bramblett<sup>14</sup> summarized the process of tentative sex identification. Because the sternum was present here, the length and body of the sternum could be measured to identify the sex of the victim. Specimens greater than 140 mm in length are generally male and those less than 130 mm

**Table 2**

Distribution of injury by skeletal element. Trauma type: \* = sharp single blade (knife), \*\* = sharp single blade shearing against dull blade (tin snips), \*\*\* = blunt implement mark. Measurements indicate length of mark. Right and left, refer to anatomical right and left.

Skeletal element	Trauma type	Description
<i>Post-Cranial Bones</i>		
Sternum	*	Inverted T-shaped fracture on posterior midsection of body with continuing fracture on right anterior body
	*	Longitudinal cut through left costal articulations extending 7.3 cm
	*	Cut mark on left clavicular notch (1.2 cm)
	*	Diagonal trail mark on posterior body of manubrium (4.0 cm)
	*	Longitudinal trail mark on lower posterior body (3.0 cm)
Right scapula	*	Horizontal fracture extending from scapula notch to medial border (5.5 cm) – trail mark present on dorsal border of fracture
Left scapula	*	Cut mark on lower spine (1.5 cm), 2.5 cm from medial border
Right clavicle	*	Two small cut marks (0.2 cm each), parallel to one another, on superior posterior surface, 6.5 cm from sternal articulation
Left clavicle	*	Cut mark (0.4 cm) on inferior surface, 6.5 cm from sternal articulation – possibly related cut mark on inferior sternal articulation (0.1 cm)
Right humerus	***	Indentation (1.4 cm × 0.7 cm) on head
	*	Two possible trail marks on posterior of neck, parallel to each other (1.5 cm)
Left radius	*	Possible cut mark near dorsal tubercle
Right femur	*	Cut mark on lateral condyle (1.2 cm × 0.8 cm)
Left tibia	*	Cut mark on anterior medial malleolus (1.5 cm × 0.9 cm)
	*	Trail marks (1.2 cm), anterior to fibular articular surface; (2.7 cm) extending from cut on anterior medial malleolus
	*	Several cut marks near tibial tuberosity: 2.5 cm mark extending diagonally, 0.9 cm mark, 1.0 cm distal, and parallel to the first, 0.8 cm
	*	Mark extending between the other two cut marks (1.0 cm × 0.2 cm) on anterior proximal area between medial and lateral condyle left fibula styloid process broken off
Right fibula	*	Broken at midshaft, both proximal and distal ends broken off
Left calcaneus	*	Cut mark on medial surface underneath sustentaculum tali
1st cervical vertebrae	*	Cut mark (0.5 cm) on superior right transverse process near foramen
	*	Possible cut mark on anterior tubercle
	*	Trail marks/possible cut marks on right and left sides near inferior articular facets and groove for vertebral artery
2nd cervical vertebrae	*	Trail mark extending diagonally across left side of spinous process (1.0 cm)
7th cervical vertebrae	*	Cut mark (1.0 cm) on spinous process, parallel cut marks (0.4 cm) on right articular facet
3rd thoracic vertebrae	*	Fracture of spinous process with cut mark (2.5 cm) extending from fracture along spinous process
5th thoracic vertebrae	*	Parallel cut marks (0.5 cm and 1.0 cm) near left superior costal demifacet of the centrum
8th thoracic vertebrae	*	Slight fracture on superior portion of spinous process (0.4 cm). Fracture/cut mark (1.4 cm) on left side of the spinous process
9th thoracic vertebrae	*	Cut mark (0.7 cm) on inferior body near vertebral foramen
11th thoracic vertebrae	*	Left transverse process fractured off
12th thoracic vertebrae	*	Left superior articular process damaged – probably associated with cut on 11th thoracic vertebrae
	*	Cut mark on left side of spinous process
1st lumbar vertebrae	*	Five cut marks extending across superior surface of centrum (3.0 cm, 2.2 cm, cluster of three cuts of 0.6 cm each)
	*	Two cuts with trail marks on the left side of vertebral body (1.7 cm × 0.55 cm and 0.7 cm × 0.4 cm)
2nd lumbar vertebrae	*	Right transverse process severed
	*	Trail mark (0.7 cm) extending diagonally on right side of spinous process
	*	Left transverse process fractured
	*	Cut mark on right anterior side of vertebral body (1.6 cm × 0.9 cm)
	*	Trail mark associated with fractured right transverse process extending across right side of vertebral body (0.9 cm)
3rd lumbar vertebrae	*	Left spinous process cut and fractured fractured off – possibly associated with damaged left transverse process of second lumbar vertebrae
	*	Two related marks: one extending across left pedicle (0.5 cm) and a second extending near the right pedicle (0.8 cm)
4th lumbar vertebrae	*	Left and right transverse processes fractured – possibly related to fractures of the transverse processes of third and fifth lumbar vertebrae
	*	Right and left transverse processes fractured off
5th lumbar vertebrae	*	Two pronounced cut marks parallel to one another on anterior left vertebral body – one cut extends across surface of centrum (1.95 cm × 0.25 cm)
1st sacral vertebrae	*	A second cut extends across right transverse process resulting in fracture of the left superior articular process (3.95 cm × 0.2 cm)
2nd sacral vertebrae	*	Diagonal cut mark (1.5 cm) on anterior body of second sacral element
2nd right rib	**	Partial lateral fracture 5.0 cm from sternal end
3rd right rib	**	Hesitation mark 2.4 cm from distal end and clean oblique fracture 5.6 cm from sternal end
4th right rib	**	Clean oblique fracture near sternal end
5th right rib	**	Irregular fracture near sternal end
	**	Hesitation mark 5.7 cm from sternal end
	**	Oblique, spiral fracture middle of rib
6th right rib	**	Fracture 3.5 cm from sternal end, hesitation mark 1.8 cm from sternal end
7th right rib	**	Hesitation mark 5.0 cm from sternal end
8th right rib	**	Hesitation mark 5.2 cm from sternal end
10th right rib	**	Irregular fracture near sternal end not associated with any hesitation marks
11th right rib	**	Irregular fractures near sternal end
2nd left rib	**	Partial fracture 1.3 cm from sternal end
3rd left rib	**	Greenstick fracture approximately mid-rib
4th left rib	**	Clean fracture near sternal end
5th left rib	**	Oblique fracture near sternal end
6th left rib	**	Partial perpendicular fracture 2.3 cm from sternal end greenstick fracture. Oblique fracture 8.5 cm from sternal end
7th left rib	**	Clean fracture 4.5 cm from sternal end

Table 2 (continued)

Skeletal element	Trauma type	Description
8th left rib	**	Fracture 4.5 cm from sternal end
9th left rib	**	Irregular fracture near sternal end greenstick fracture – torsion fracture at midshaft
10th left rib	**	Irregular fracture at sternal end
11th left rib	**	Irregular fracture at sternal end
<i>Cranial Bones</i>		
Frontal	Ice pick	Perforating fracture on superior margin of right orbit in area of supraorbital notch. Perforates frontal above sinus (1.1 cm × 0.6 cm) and continues through inner table (0.6 cm × 0.3 cm)
	***	Patterned, half-circle mark 2.2 cm in diameter present on the forehead about 3.0 cm above glabella
Right parietal	***	Fractures radiate from a blow that displaced ectocranial bone in a 8.0 mm × 7.0 mm area immediately left of the sagittal suture, about 1.2 cm anterior to the parietal foramina
Lateroanterior region	***	Blow to the left side of the skull in the region of the articulation of the frontal, temporal, and sphenoid bones that displaced bone from a 1.5 cm × 2.7 cm area at the sphenoid articulation. Radiation fracture continues partway along the left temporal toward the external auditory meatus
Right temporal	***	Approximately 6.2 cm × 3.2 cm area of the squama fractured off and not recovered. Zygomatic process of the temporal is also missing. Suggestive of blunt instrument damage
Occipital	***	Blow with radiating fractures present on the right side of the occipital between the lateral edge of the foramen magnum and the occipito-temporal suture near the mastoid process
Midfacial region	***	Unknown number of blows

are generally female.<sup>13,15</sup> The sternum from the decedent is 121 mm long and therefore indicates a female origin.

The humerus can be used as an indicator of sex through the interpretation of sexual dimorphism in bone robustness.<sup>15</sup> Researchers have examined the humeral head diameter and have found trends related to sex. Diameters in excess of 47 mm are generally male and those less than 43 mm are generally female.<sup>13,15</sup> The humeral head from the decedent is 40 mm and therefore is in the range of primarily female humeri. Perforated septa of the olecranon fossae occur 3.7 times more frequently in females than males.<sup>13,15</sup> The olecranon fossa of the left humerus exhibits perforation. These observations, which were present, are consistent with a female humerus.

Sacra can provide an idea of sex if they are morphologically normal.<sup>15</sup> The sacrum of the decedent was abnormal. It possesses only four fused sacral vertebrae where the first sacral vertebra has undergone lumbarization. Therefore, this sacrum is not ideal for reliable for sex determination.

The femur can assist in sex determination, as summarized by Bass.<sup>16</sup> Midshaft circumference measurements less than 81 mm are indicative of females, while measurements above 81 mm are indicative of males.<sup>13,15</sup> The midshaft circumference of the decedent is 74 mm, consistent with a female skeleton. With regard to the diameter of the femoral head, a measurement of less than 42.5 mm indicates a female, a measurement of 42.5–43.5 mm indicates a probable female, a measurement of 43.5–46.5 mm is indeterminate for sex identification, a measurement of 46.5–47.5 mm indicates a probable male, and a measurement greater than 47.5 mm indicates a male. The decedent possesses a femoral head circumference of 38 mm and therefore falls into the female range. In addition, the length of the femur, 415 mm, from the decedent falls beneath the mean female length of 439.1 mm. Thus, the indications from the femur strongly suggest a female victim.

Beyond these indicators from individual bones, the overall small size and gracility of the decedent was also suggestive of a female. To demonstrate this, investigators compared a series of measurements from the long bones and the mean measurements published by Iscan and Cotton.<sup>17</sup> The decedent's measurements fall beneath the mean for caucasoid women more often than not, and usually within one standard deviation.

All indications of age suggest that the decedent was a young adult. Through the examination of dental eruption and epiphyseal closure patterns, examiners can accurately estimate age of individuals younger than twenty-one. Individuals older than this can be aged to a lesser degree of accuracy by the examination of cranial

suture closure patterns and degree of rib ossification. Beyond these indicators, development of degenerative disease and dental attrition can also provide an idea of the age of the decedent; however, none with a high degree of certainty.<sup>15</sup> For this decedent, all epiphyses present have closed, indicating that the individual survived into her twenties. Her mandibular third molars are only partially erupted, which would suggest an earlier age of 15–21 years old; however, the mandible of this individual is very small and may have delayed or prevented full eruption of the molars. Discounted due to their anomalous results, the dental indications that the decedent was of a relatively young age were not included in final determination of age.

All cranial sutures remained open with the exception of the sagittal suture, which has closed and fused, and the coronal suture, which is fused endocranially. This probably represents a premature cranial synostosis affecting first the sagittal suture and the coronal suture second. The fact that the other sutures, unaffected by synostosis, are open is suggestive of a young adult. Through examination of the sutures of the lateroanterior region of the skull, it is possible to be more accurately estimate age.<sup>13</sup> However, because this area was damaged on the decedent prior to recovery efforts, examination was not possible.

The costal-sternal cartilage ossifies at a constant rate and can therefore be an additional tool in age determination. Typically, the fourth rib assesses age based on costal pit depth, shape, and rim configuration, scored on a 1–5 scale.<sup>18</sup> In the case of this decedent, the perpetrator had removed the distal ends of both fourth ribs and thus, they were not located during the recovery efforts. The terminal end of the sixth right rib was in good condition when recovered. The pit depth of the sixth rib was 3.5 mm (score 2), which indicates a mean age of 30.7 years (sd = 12.4 years). The pit is U-shaped with thick walls (score 3), indicating a mean age of 30.5 years (sd = 9.61 years). Rim configuration includes sturdy walls, reduced scalloping, and the presence of incipient bony projections (score 3) that indicates an age of 34.3 years (sd = 11.62 years). A total score of 8 was yielded, indicative of a victim age of 27 years (sd = 4.9 years). Thus, the rib analysis indicates that the decedent died in young adulthood, around thirty years of age.

The age, sex, race, and stature estimations were consistent with a missing person reported approximately three years prior to the discovery of the skeleton from a nearby town. Investigators made a positive identification through photo superimposition of the skull, utilizing outside experts in skull reconstruction and photo superimpositions to complete the analysis.



#### 4.1. Trauma related to criminality

There is evidence for four types of implements applied to the body: patterned injury with a cylindrical weapon, sharp force trauma (blade), sharp force trauma (cutting tool with two shearing blades), and blunt force trauma (Tables 2 and 3).

Penetrating injury with a cylindrical weapon was evident on one bone. A circular pattern defect was obvious on the frontal upper border of the right eye orbit. This is consistent with an ice pick thrust aimed at the eye.<sup>19,20</sup> The mark above the eye is consistent with a victim who moved her head before impact. The location of the injury is indicative of a perpetrator that may have aimed to

blind the decedent. Examiners were unable to lend further examination to the bones of the orbit for additional stab marks because they were either fragmented or missing.

Other sharp force marks appear in or near the joint areas of the left tibia and right femur. Most sharp implement marks are concentrated on the vertebra. The deepest marks occur on the sacral vertebra and indicate penetration of the abdominal cavity (Fig. 2). Other marks occur on the posterior portions of the spine. These stabs were very forceful, with six-stab wounds penetrating all the way through the abdomen, including one that passed through and fractured one superior articular vertebral process.

**Table 3**

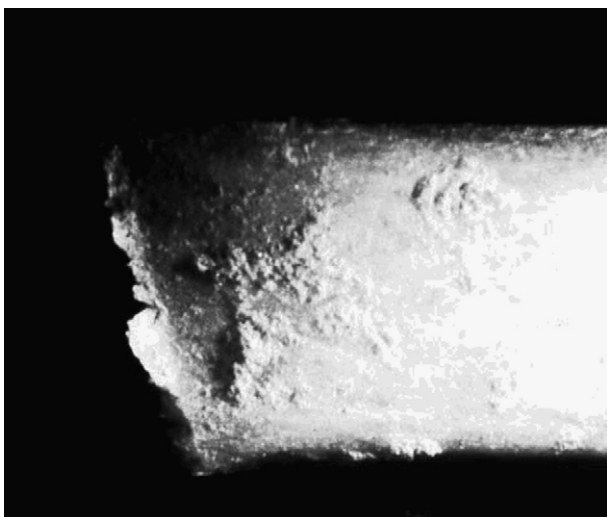
Behavior interpretations of injury by skeletal element. 1 = torture stage, 2 = homicide stage, 3 = “autopsy” stage, 4 = disposal stage, 5 = uncertain.

Skeletal element	Stage	Description
<i>Post-Cranial Bones</i>		
Sternum	3	The bone was nicked when soft tissue was severed in the process of prying open the thorax
Right scapula	4	A knife was used in disarticulation to cut tendons and joints
Left scapula	4	A knife was used in disarticulation to cut tendons and joints
Right clavicle	3	A knife was used to cut soft tissue to open chest cavity by prying up the chest plate
Left clavicle	3	A knife was used to cut soft tissue to open chest cavity by prying up the chest plate
Right humerus	4	A heavy blade, perhaps an axe, was used to disarticulate the body
Left radius	4	A heavy blade, perhaps an axe, was used to disarticulate the body
Right femur	4	A heavy blade, perhaps an axe, was used to disarticulate the body
Left tibia	4	A heavy blade, perhaps an axe, was used to disarticulate the body
Right fibula	4	A heavy blade, perhaps an axe, was used to disarticulate the body
Left calcaneus	4	A heavy blade, perhaps an axe, was used to disarticulate the body
1st cervical vertebra	4	A knife was used in disarticulation to cut joints and tendons
2nd cervical vertebra	4	A knife was used in disarticulation to cut joints and tendons
7th cervical vertebra	4	A knife was used in disarticulation to cut joints and tendons
3rd thoracic vertebra	4	A knife was used in disarticulation to cut joints and tendons
5th thoracic vertebra, ventral aspect	2	Multiple forceful stabs penetrated through the abdomen
8th thoracic vertebra	4	A knife was used in disarticulation to cut joints and tendons
9th thoracic vertebra	2	Multiple forceful stabs penetrated through the abdomen
11th thoracic vertebra	4	A knife was used in disarticulation to cut joints and tendons
12th thoracic vertebra, spinous process	4	A knife was used in disarticulation to cut joints and tendons
12th thoracic vertebra, articular process	2	Multiple forceful stabs penetrated through the abdomen
1st lumbar vertebra	2	Multiple forceful stabs penetrated through the abdomen
2nd lumbar vertebra, dorsal aspect	4	A knife was used in disarticulation to cut joints and tendons
2nd lumbar vertebra, ventral aspect	2	Multiple forceful stabs penetrated through the abdomen
3rd lumbar vertebra, ventral aspect	2	Multiple forceful stabs penetrated through the abdomen
4th lumbar vertebra, ventral aspect	2	Multiple forceful stabs penetrated through the abdomen
5th lumbar vertebra, ventral aspect	2	Multiple forceful stabs penetrated through the abdomen
1st sacral vertebra, ventral aspect	2	Multiple forceful stabs penetrated through the abdomen
2nd sacral vertebra, ventral aspect	2	Multiple forceful stabs penetrated through the abdomen
2nd right rib	3	Shearing blade tool, like tin snips, used to open chest cavity
3rd right rib	3	Shearing blade tool, like tin snips, used to open chest cavity
4th right rib	3	Shearing blade tool, like tin snips, used to open chest cavity
5th right rib	3	Shearing blade tool, like tin snips, used to open chest cavity
6th right rib	3	Shearing blade tool, like tin snips, used to open chest cavity
7th right rib	3	Shearing blade tool, like tin snips, used to open chest cavity
8th right rib	3	Shearing blade tool, like tin snips, used to open chest cavity
10th right rib	3	Shearing blade tool, like tin snips, used to open chest cavity
11th right rib	3	Shearing blade tool, like tin snips, used to open chest cavity
2nd left rib	3	Shearing blade tool, like tin snips, used to open chest cavity
3rd left rib	3	Shearing blade tool, like tin snips, used to open chest cavity
4th left rib	3	Shearing blade tool, like tin snips, used to open chest cavity
5th left rib	3	Shearing blade tool, like tin snips, used to open chest cavity
6th left rib	3	Shearing blade tool, like tin snips, used to open chest cavity
7th left rib	3	Shearing blade tool, like tin snips, used to open chest cavity
8th left rib	3	Shearing blade tool, like tin snips, used to open chest cavity
9th left rib	3	Shearing blade tool, like tin snips, used to open chest cavity
10th left rib	3	Shearing blade tool, like tin snips, used to open chest cavity
11th left rib	3	Shearing blade tool, like tin snips, used to open chest cavity
<i>Cranial Bones</i>		
Frontal	1	Ice pick thrust to eye entered bone just above the eye
	5	Heavy blows smashed the skull
Right parietal	5	Heavy blows smashed the skull
Lateroanterior region	5	Heavy blows smashed the skull
Right temporal	5	Heavy blows smashed the skull
Occipital	5	Heavy blows smashed the skull
Facial Skeleton	5	Many blows focused destruction on the face, shattering and deforming the bones

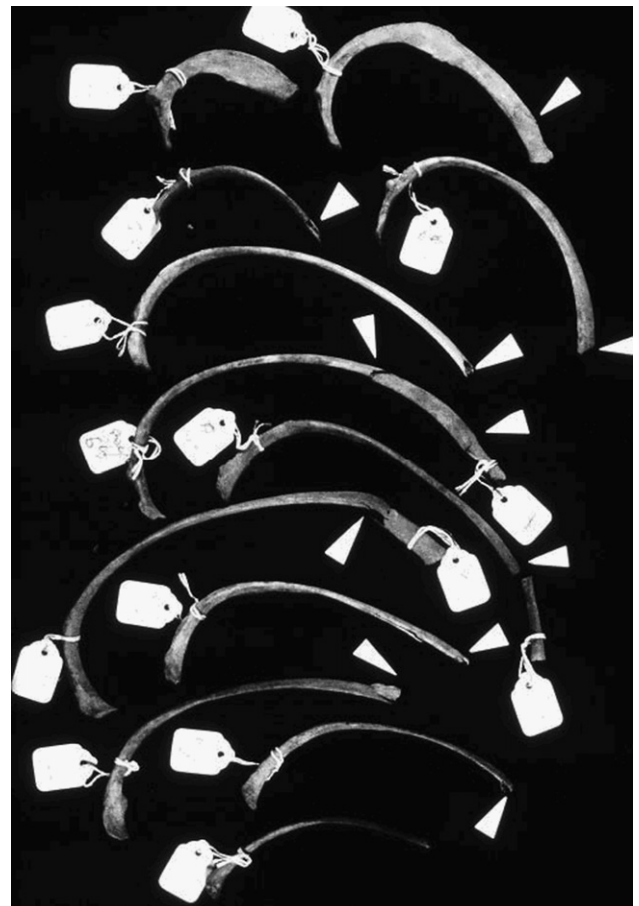


**Fig. 2.** Two sharp force marks on sacral vertebrae. In this individual, the first sacral vertebra was “lumbarized” which means that it was not part of the sacrum itself and appears as a lumbar vertebra. The deepest marks occur on the 1st sacral vertebra and indicate penetration of the abdominal cavity. This mark indicates that the stab wound came from the front of the victim. The mark evident on the sacrum itself shows a different orientation of direction. The disruption of the bone shows that this stab was angled upwards.

Shearing blade cutting tool fractures are limited to the thoracic region, specifically the ribs near the sternal articulations. All nineteen recovered ribs exhibited cut marks or incomplete cut marks from shearing force (Table 2). The implement used was a double bladed, shearing tool (Figs. 3 and 4). The ribs and rib fragments show compression at the fractures, which is consistent with tin snips. Clean cuts are more common on the right ribs. Cuts are patterned at a mean of 5.0 cm ( $n = 6$ ) from the sternal end of the ribs. Hesitation marks (unsuccessful attempts to cut ribs) are scattered along right rib shafts from 1.8 to 2.4 cm ( $n = 2$ ) from the sternal end of the right ribs (Fig. 4). Less consistent cut marks are present on the left ribs at an average of 3.5 cm ( $n = 4$ ) from the sternal articulation. Clean fractures were not consistently obtained with this implement as either the ribs split or the tool failed to cut the ribs. Irregular fractures from crushing the rib were common on



**Fig. 3.** Cut marks on rib resulting from a crude “autopsy” of the victim.



**Fig. 4.** Hesitation marks (incomplete cuts) are indicated by arrows.



Fig. 5. Blunt instrument trauma to the skull.

the left ribs. The marks infer that the perpetrator opened the decedent's thoracic cavity in a manner similar to a medical autopsy.

Except for one blow to the proximal articulation of the right humerus, blunt implement trauma was restricted to the cranium, which sustained fragmentation by multiple blows (Figs. 5 and 6). The first blow was to the right parietal, immediately left of the sagittal suture, about 1.2 cm anterior to the parietal foramina. Secondary blows, delivered to other parts of the skull included a blow to the left side of the skull in the region of the articulation of the frontal, temporal, and sphenoid bones and a probable blow to the right side of the skull in the mid-temporal region. A blunt force blow to the base of the skull appeared on the right side of the occipital between the lateral edge of the foramen magnum and the occipito-temporal suture near the mastoid process. The facial region of the skull inferior to the upper orbits and superior to the base of the nasal cavity was fragmented and missing (Fig. 6).

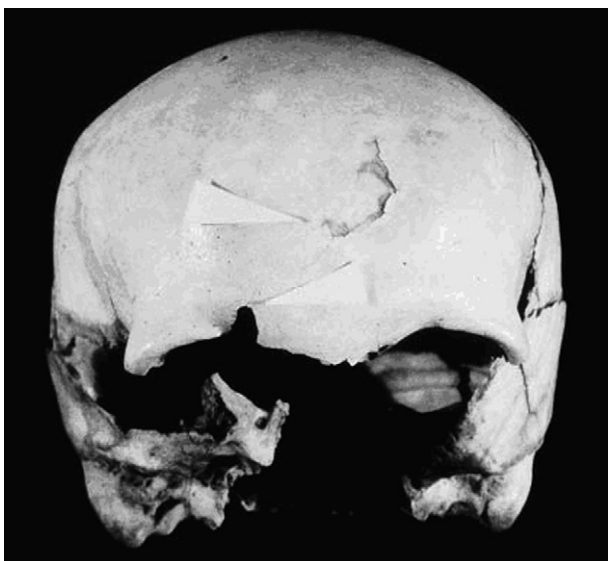


Fig. 6. Fragmentation of the facial skeleton.

Portions of the base of the skull, including the basilar portion of the occipital and the inferior sphenoid, were also missing.

#### 4.2. Evidence of criminal acts

Strictly speaking, most of the marks found on the bones were inflicted peri-mortem, or at or around the time of death. Also noted were brownish discolorations in the lumbar vertebrae around sharp-forced trauma defects. These were consistent with ante-mortem trauma in which blood pumped into the defects through vascular action. Thus, stabbing is the best conjecture regarding the cause of death. The manner of death was determined to be homicide. After analyzing the relation of trauma marks to each other in the reconstructed skeleton, examiners developed a putative sequence of events.

One of the singular aspects of this case is the circular patterned defect through the frontal bone above the right eye orbit. The shape and size of the perforation is consistent with an ice pick, which penetrated through the outer table, and frontal sinus, ultimately entering the brain.<sup>19,20</sup> One small fracture radiates from the circular defect. This is consistent with an attempt by the assailant to penetrate the eye of the victim.

While the eye injury may reflect the torture of a living person, mutilation of the eyes may alternatively speak more to the savagery of the damage than the psychological torture of the victim – depending on what we might learn from other sources of evidence in the case material.

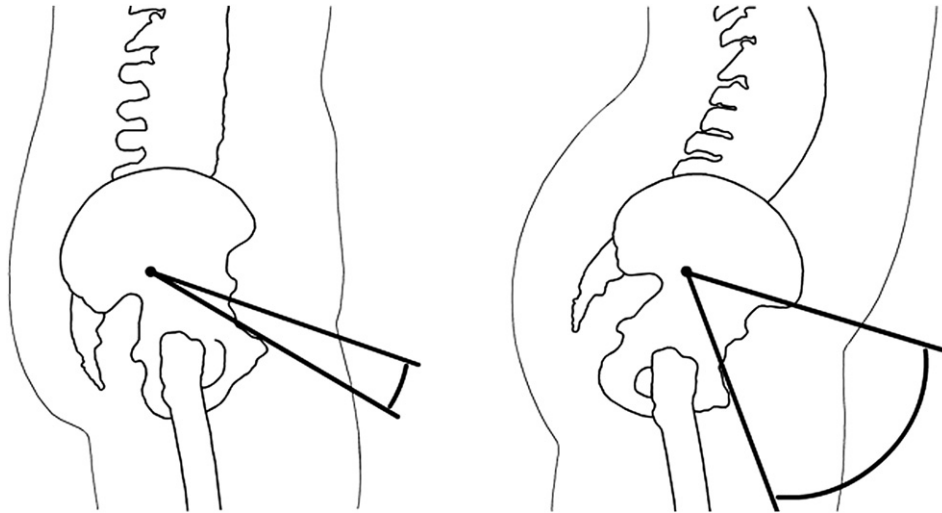
#### 4.3. Stabbing and exsanguination

The victim suffered at least six penetrating wounds to the abdomen. Utilizing a thick blade to produce these wounds caused the breakage of one vertebral element and deep cut marks on others. These were forceful penetrations as evidenced by the fact that the blade pierced the front of the abdomen and displaced processes of one spinal element after penetrating the entirety of the abdominal cavity. Vertebral defects caused by the blade allowed for blood to pump through them, indicating that the victim was alive when these wounds were inflicted. Thus, death was most likely due to exsanguination resulting from these penetrating injuries.

When interpreted in context of the structure of the pelvic girdle, the orientation of wounds can reveal the angle of penetration through the abdomen or anus.<sup>21</sup> The direction of the penetrating marks to the sacral region supports the interpretation that at the time of penetration, the victim was vertically suspended (Fig. 7). The sharp force trauma mark on the 1st sacral vertebra appears to have resulted from a stab coming from the front, angled upwards. The stab wound on the lumbar vertebra immediately above the sacrum clearly came from the front and again, angled upwards. The suspect was significantly taller than the petite decedent. Therefore, it would have been impossible for the suspect to stab the abdomen from the front and in an upward motion, unless the victim was raised or suspended. Also consistent with suspension is the impact the penetration had on the sacrum, as a frontal thrust could not have fully impacted the sacrum unless the pelvic girdle was tilted downwards at the os pubis. If the victim were in an upright, standing orientation, the bones of the anterior pelvic girdle would have blocked the stab.

Written record of the suspect reveals that he fixated on the abdomen, with suspension making the abdomen more concave and stretched. The knife would not need to be very long to penetrate a 110 lb victim's abdomen if a thrust with force reached the vertebrae.<sup>22</sup> This type of injury required a fairly short and robust blade, especially if the offender had a strong grip to keep the knife from slipping out of his hand.





**Fig. 7.** The sharp force mark on the sacrum shown in Fig. 1 was the result of a thrust from the front of the victim and angled upward. The approximate impact of the blade on the sacrum is shown as a dot in both diagrams. If the victim was in standing position as shown in the right diagram, pelvic bones would have obstructed the upward thrust and the perpetrator would have had a very small angle of attack. However, if suspended, as shown in the left diagram, the victim's pelvic girdle would tilt downwards anteriorly. This would open the abdomen to a greater angle of attack for an upward thrust.

#### 4.4. Dissection

Perhaps the strangest aspect of this case was the dissection of the victim. In a manner similar to autopsy, the perpetrator used a tin snips, or an implement with similar function, to cut the thoracic cavity open. The nature of the fractures of the ribs indicates that the corpse was fresh during the severing of the ribs. However, the assailant displayed crudeness and inefficiency in his autopsy-like dissection. The perpetrator managed to cut the ribs on both sides of the thoracic cavity, separating the center of the ribcage with the sternum. With the bisection of the ribs completed, he opened the chest cavity by lifting the center of the ribcage upward toward the head of the decedent. A flat impression on the dorsal side of the sternum indicates that there was considerable force used to pry this section upwards. The perpetrator ultimately removed the central ribcage by cutting the soft tissue articulations of the ribs with the clavicles, as evidenced by cut marks present on the clavicles at excavation. Through this process, he made a “window” through the center of the chest, completing the dissection.

#### 4.5. Blunt force to the head

A series of blunt force impacts are evident in the cranial vault and facial skeleton. The assailant focused destructive blows to the face of the victim. The impact of the blows was so severe that the skull fragmented and completely shattered the face. Only after meticulous search for facial skeleton fragments and extensive modeling of missing fragments, was it possible to reconstruct the skull and face. This work was done by experts independent of the authors of this paper. With the face as the focus of the post-mortem blunt force trauma, disfigurement is evident as a clear intent of the assailant.

#### 4.6. Disarticulation and disposal

Evidence suggests that the corpse may have been partially clad in a sweater, jeans, and brassiere when the dissection was completed. There was a lack of blood observed on the clothing. The assailant used another sharp blade, such as an axe, to sever the corpse at the leg joints. Smaller cut marks are present on the posterior vertebrae, which appear to have resulted during the severing of the torso to

facilitate concealment, transport, and/or disposal. After severing and dismantling the corpse, the perpetrator took the fragmented decedent to the countryside and deposited the body parts, partially burying some and leaving others on the ground surface. Importantly, the recovery efforts did not locate the os coxae, which are the large bones on either side of the pelvic girdle. Because of the scant evidence of carnivore activity at the crime scene, these parts of the body were not likely left at the site of deposition.

The evidence reflects that the inspirations for this homicide included kidnapping and sexual torture, mutilation, abdominal penetration, and dissection. Evidence also reflects the perpetrator's return to the remains after the event.

### 5. Other investigative data

Rape, as we normally think about it, may not have been the motive. However, this crime reflects re-occurring elements of sexuality and the offender engaged in kidnapping, false imprisonment, criminal sexual acts, torture, and ultimately, homicide.

Offenders who commit these sexually motivated crimes often return to the body to determine if the police discovered the body and disposal site, to relive the crime through fantasy, and/or to determine if they have left any evidence that investigators might use.<sup>23</sup> Evidence in this case supports that the offender may have returned to the scene and further manipulated both the evidence and the victim's remains. As illustrated in the recovery of the ribs, which were wrapped in the brassiere strap, evidence also stems from the partial redressing of the victim. It is likely that this victim was disrobed during much of the exploration and disarticulation of the body. The clothing items did not contain the amount of bloodstaining or spatter expected to have accumulated during this type of dissection and exploration of the victim's body cavity.<sup>24</sup> The offender likely redressed the body post-mortem and possibly at the disposal site. Absent undergarments are kept in some sexual homicides as a “trophy” (item used by offenders to remind them of their “great conquest” and to relive the crime in fantasy).<sup>23</sup> The discovery of the victim with her brassiere but no undergarment displays more evidence to confirm that the perpetrator may have retained the undergarments in this manner.

The extensive body mutilation and the number of tools used during that process would support that the offender took the victim

to an isolated location where time would not be a factor, to prevent discovery. These actions also indicate that the offender prepared for the mutilation by gathering the implements necessary to perform the different mutilations detailed by these examiners. Because of the force exerted by the offender during this sharp instrument attack on the abdomen and the small frame of the victim, the size of the knife would not need to be extensive to penetrate through the vertebrae.

Upon discovering this type of homicide, one must consider whether the offender has committed a sexually sadistic homicide or a lust murder. The sexually sadistic offender is one who will receive sexual pleasure and satisfaction from the psychological and physical torture of the victim.<sup>25</sup> Lust murder distinguishes itself from the sexually sadistic murder through the extent of the victim mutilation and often involves the sexual regions, including possible displacement of the breasts, genitals, and/or rectum.<sup>26</sup> Because of the great amount of mutilation to the body, the victim dies quickly from the extensive injuries in the lust murder. Therefore the distinction lies in the post-mortem mutilation of the victim. If the

offender were sexually sadistic, the pleasure from the torture of the victim would end when the victim dies. The lust murderer on the other hand enjoys the exploration, experimentation, and mutilation of the corpse, even though the victim has expired from their wounds. The decomposition of the body in the present case prevents the full determination of the type and extent of sexual assault and organ removal or displacement. What can be determined, without question, is that there was a violent attack with a sharp force instrument to the victim's abdominal region and extensive post-mortem exploration and mutilation.

### 6. Homicide reconstruction: evidence of depravity

Through assessment of the recovered remains, utilization of forensic anthropology allowed for identification of a number of items of depravity. Assessing the evidence for each aspect of The Depravity Standard, clear indication was found for the following items (Table 4):

**Table 4**  
Presence of Welner depravity scale (WDS) items and examples.

Welner depravity standard item	Presence	Examples
1 Intent to emotionally traumatize the victim, or to maximize terror through humiliation.	Definitely present	(1) Attempting to blind the victim by stabbing her above the eye (2) Suspending the victim– must clarify whether as a mechanism for restraint or intentional torture
2 Intent to maximize damage or destruction, by suffering and degree if only one person is victimized.	Definitely present	(1) Series of blunt force attacks to the face and head (2) Repeated penetration of the abdomen
3 Intent to cause physical disfigurement.	Possibly present	(1) Series of blunt force impacts which shattered victim's face, leaving her unrecognizable
4 Intent to carry out a crime for excitement of the criminal act alone.	Insufficient evidence	(1) Opening the victim, similar to an autopsy
5 Targeting victims who are not merely vulnerable, but helpless.	Insufficient evidence	(1) Condition of the victim before the crime is unknown
6 Carrying out a crime in spite of a close and trusting relationship to the victim.	Insufficient evidence	(1) Relationship of assailant to victim is unknown
7 Influencing depravity in others in order to destroy more.	Insufficient evidence	(1) Role of accomplices unclear, even with multiple weapons
8 Escalating the depravity; inspiration for more.	Insufficient evidence	(1) Possible that assault was carried out over an extended period, with escalating suffering
9 Carrying out a crime in order to terrorize others.	Insufficient evidence	(1) Reaction of others unknown
10 Carrying out crime in order to gain social acceptance or attention.	Insufficient evidence	(2) Body was concealed; only os coxae not recovered (1) Unclear as to any ritual involved, or exposure of witnesses to crime
11 Influencing criminality in others to avoid prosecution or penalty.	Insufficient evidence	(1) Unknown relationship of assailant to any others
12 Disregarding the known consequences to the victim.	Insufficient evidence	(1) Communication between victim and assailant unknown
13 Targeting victims based upon prejudice.	Insufficient evidence	(1) Basis for choosing victim unknown
14 Prolonging the duration of the victim's suffering.	Definitely present	(1) Victim was suspended before being attacked with unusually penetrating abdominal wounds
15 Unrelenting physical and emotional attack; amount of attacking.	Definitely present	(1) The cranium and face were fragmented by a series of blows with at least six deeply penetrating wounds to victim's abdomen
16 Exceptional degree of physical harm; amount of damage.	Definitely present	(1) Facial injuries would have left victim unrecognizable (2) Skull blows would have inflicted significant brain damage
17 Unusual quality of suffering of the victim.	Definitely present	(1) Assailant immobilized victim by suspending her (2) Whether or not the assailant blinded the victim before death
18 Indulgence of actions, inconsistent with social context	Definitely present	(1) Assailant immobilized victim by suspending her (2) Orchestration of crime, including opening of chest cavity, which suggests specific weapons chosen to fit mutilation agenda
19 Carrying out attack in unnecessarily close proximity to the victim.	Definitely present	(1) Multiple invasive weapons used (2) Orchestration of crime, including opening of chest cavity, which suggests specific weapons chosen to fit mutilation agenda
20 Extreme response to trivial irritant; actions clearly disproportionate to the perceived provocation.	Insufficient evidence	(1) Antecedent to crime undetermined
21 Satisfaction or pleasure in response to the actions and their impact.	Insufficient evidence	(1) Assailant's response to attack unknown
22 Despite criminal responsibility, falsely implicating or accusing others of actions, knowingly exposing them to penalty resulting in the falsely accused being investigated and jailed, and perhaps even tried.	Insufficient evidence	(1) Unclear what assailant communicated about the event, and to whom
23 Projecting responsibility onto the victim; feeling entitlement to carry out the action.	Insufficient evidence	(1) Attitude of assailant toward the victim unknown
24 Disrespect for the victim after the fact.	Definitely present	(1) Assailant dissected victim to view internal organs (2) Use of axe-like blade for partial dismemberment of the corpse
25 Indifference to the actions and their impact.	Insufficient evidence	(1) Assailant's attitudes unavailable for study

#### 6.1. *Intent to emotionally traumatize the victim, or to maximize terror through humiliation*

Blinding the victim would have inspired a great sense of terror in someone rendered helpless, especially in an ongoing violent attack. The assailant's restraint of the victim may have been necessary in order to enable certain aspects of the physical assault; however, additional evidence, might clarify whether the restraint also reflected intent to emotionally traumatize the victim.

#### 6.2. *Intent to maximize damage or destruction by suffering and degree*

A series of blunt force impacts are evident in the cranial vault and facial skeleton. The force of the impacts was so severe that the skull fragmented. The assailant repeatedly penetrated the victim's abdomen with a knife from the front toward the back. Evidence supports that the victim was vertically suspended during these attacks, further evidence of the perpetrator's intent to maximize destruction.

#### 6.3. *Intent to cause physical disfigurement*

The sharp implement trauma to the frontal bone is a circular defect that penetrates the cranial vault through the frontal sinus. The shape and size of the perforation is consistent with an ice pick. One small fracture radiates from the circular defect. This is consistent with both a targeted attempt by the assailant to penetrate the eye of the victim and a clear intent to disfigure. The fact that the ice pick penetrated above the eye could be due to the instinctive movement of the victim's head to avoid the direct eye injury. The assailant focused destructive blows to the face of the victim, completely shattering it. Only after meticulous search for facial skeleton fragments and extensive modeling of missing fragments, was it possible to reconstruct the skull and face.

#### 6.4. *Targeting victims who are not merely vulnerable, but helpless*

While the assailant's stature is unknown, the victim was a small petite female. Furthermore, the orientation of the penetrating marks to the lumbar and sacral region suggest that the victim sustained vertical suspension at the time of penetration, creating a state of physical helplessness.

#### 6.5. *Unrelenting physical and emotional attack; amount of attacking*

The amount of damage was exceptional, evidenced by the diversity of weapons and tools used on the victim, the inclusion of torture as part of the crime, and the remarkable destruction done to the victim.

#### 6.6. *Exceptional degree of physical harm and damage*

The victim suffered at least six penetrating wounds to the abdomen, made by a robust blade. The blade even displaced processes of the spinal elements after penetrating all of the way through the abdomen. The penetrations essentially pierced through the entire abdominal cavity. The damage to the skull and face was probably inflicted post-mortem. The force of the blows was sufficient to fracture and virtually destroy the face, including attacking focused around the eyes.

#### 6.7. *Unusual quality of suffering of the victim; victim demonstrated panic, terror, and helplessness*

Blinding the victim was an unusual quality of the attack. Furthermore, the probable restraint and vertical suspension of the victim would also have amplified the victim's terror. Further investigation of this item would explore whether removal of the victim's clothing for the attack had an impact on the victim's terror and humiliation.

#### 6.8. *Indulgence of actions, inconsistent with social context*

Although the context in which the victim was taken is not known, the methodology utilized by the perpetrator is inconsistent with any social context of murder. The suspension of the victim during the homicide as well as the post-mortem dissection reflects indulgence. The perpetrator did not need to engage in post-mortem activities that allowed him to view the victim's organs in order to complete the murder.

#### 6.9. *Disrespect for the victim after the fact*

The post-mortem dissection of the victim clearly evidences depravity, separating it from other homicides. Tin snips, or an implement with similar function, cut the thoracic cavity open in a manner similar to that of an autopsy, although the assailant was more crude and inefficient in his activities than a trained pathologist. He managed to cut the ribs on both sides of the thoracic cavity. Then using a pry bar, he pulled the anterior thoracic cavity open by prying at the sternum. It is of note that the assailant was interested in viewing the victim's internal organs. The brassiere became a tool of convenience, utilized to restrain the ribs, which facilitated viewing, and the corpse was still partially clad in a sweater, jeans, and brassiere when the dissection was completed.

The assailant used another sharp blade, such as an axe to dismantle the corpse at the leg joints. Smaller cut marks were present on the posterior vertebrae, and appear to be the result of cutting up the torso of the corpse in order to facilitate disposal.

Due to the absence of undergarments, other than the brassiere inferences suggest the victim was likely disrobed and redressed. Further investigation would determine whether this was done for a self-indulgent purpose. Recovery efforts at the disposal site did not uncover the os coxae, the large bones on either side of the pelvic girdle. Lack of carnivore activity is suggestive of a perpetrator who retained these bones as "trophies". Evidence that could more conclusively demonstrate this result would have to derive from other investigation.

The following item may present in this case, based upon the available anthropological evidence. However, more information would conclusively determine this intent with greater scientific certainty.

#### 6.10. *Intent to carry out a crime for excitement of the criminal act alone*

The fact that the sweater and brassiere were redressed on the torso, and that the jeans were on at least one leg, suggest that rape was not the only motive for this crime. It appears that torture, abdominal penetration, and dissection were the focus for this homicide. Whether this reflected excitement or revenge is a matter for further evidence to resolve.

## 7. Conclusion

Forensic anthropological evidence informing the protocols of The Depravity Standard (DS) is a scientifically reliable source to

inform the heinous nature of crimes. Many homicides may contain concealed evidence, with remains only available after advanced decomposition has taken place.

As evidenced in this case illustration, elements of depravity can be illustrated through sheer anthropological data. Forensic anthropologists deal with an aspect of victimology that offers the most useful scientific resource for evidence of depraved intent, actions, and attitudes.<sup>21</sup>

This case demonstrates that evidence for actions is clearer from anthropology than evidence about intent, victimology, and attitudes. Yet the evidence detailed above informs each of the other components of depravity as well. It would be a mistake to deny the informative value of anthropological evidence on the assessment of intent, victimology, and even attitudes.

Some forensic anthropology investigations arise in human rights abuse investigations related to ethnic cleansing, mass burials, or political torture. In certain instances, the discovery and processing of many bodies leaves war crimes prosecutors confronted with having to resolve which crimes reflect the 'worst of the worst' – particularly during times of reconciliation.<sup>27,28</sup> The Depravity Standard, given its specificity, assists the distinction and organization of such investigations and eases the ambiguity facing tribunals.

Awareness of the items of the DS assists law enforcement to consider issues beyond identifying one suspect. Further exploration, based upon the systematic investigation of the evidence, may yield information regarding the way in which multiple offenders relate to one another. Some questions that can be discerned include, who initiated the atrocity and whether one assailant was a controlling or manipulating party throughout the commission of the crime.

Results from forensic anthropological analysis of human remains benefits from forensic psychiatric interviewing of perpetrators and witnesses in order to reinforce a reconstruction of the event and to resolve questions of the degree of its depravity.

Beyond the identification of age and sex, anthropological analysis of injury can yield information that enables an understanding of the circumstances surrounding a given crime.<sup>6,7,8,21</sup> By reconstructing the circumstances of death via analysis of skeletal bones, the applicability of The Depravity Standard has been illustrated in this case presentation, lending further support to the utility of a standardized, evidence-based measurement of depravity. Moreover, this speaks to a better understanding of the role forensic anthropology can play in establishing the presence of depravity. Upon completion and publication of validity and reliability data, The Depravity Standard will draw from the consolidation of all the forensic science information of a case.

The developer of The Depravity Standard does not yet approve its use in actual cases. Current research<sup>29</sup> focuses on the relative weighting of individual items, when present. However, concurrent with a statistically driven threshold beyond which a depraved crime distinguishes itself, forensic science disciplines are becoming acquainted with how depravity specifically manifests in the evidence for which they have important expertise.

With the diversity of forensic science disciplines, each specialty may have little appreciation for what other forensic scientists can contribute to the reconstruction of crimes. Future discussions should relate to the application and collaboration of other disciplines toward the standardization of depraved crime analysis and how other forensic science data resolves questions that arise because of provocative, if unexplained, anthropological findings. Future cooperation between forensic anthropologists, psychologists, and psychiatrists to assess evidence for a depraved crime from human remains is advantageous to justice.

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#### Conflict of interest

The authors of this journal article have no conflict of interest whatsoever.

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